

Spirometry: Indications and Role in Asthma Diagnosis & Management

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Background

- Spirometry detects the presence of airflow obstruction, defines the severity of airflow limitation, and aids in the differential diagnosis of asthma
- When physical exam findings are not present, mild asthma may be detected by performing spirometry, especially with pre- and post bronhodilator evaluation

Background

- Spirometric measures, before and after the administration of a short acting B₂-agonist should be obtained on all capable (usually > 6 years-old) patients in whom a diagnosis of asthma is under consideration
- Testing should be performed in compliance with ATS standards

Background

- Airflow obstruction can generally be determined by using the forced expiratory volume in the first second (FEV_1) and the forced vital capacity (FVC), and the FEV_1/FVC ratio
- Peak flow should not be used to diagnose asthma because it is less reliable due to poor reproducibility and dependence on patient effort
- Remember there is no single test sufficient or adequate to diagnose asthma

Defining Airway Obstruction

- Airway obstruction is defined as a FEV_1/FVC of $< .70$ in adults and $< .80$ in children
- Obstructive defects are characterized by a disproportionate reduction in FEV_1 with respect to FVC
- An $FEV_1 < 80\%$ of normal predicted is also suggestive of airflow obstruction
- Airways obstruction may also result in reduction of other measures of airflow, such as mean mid-forced expiratory flow (FEF_{25-75})
- An FEF_{25-75} which is $< 50-60\%$ of predicted normal value is indicative of small airways obstruction

Reversible Airway Obstruction

- Reversible airway obstruction is documented with improvement in FEV_1 of $> 12\%$ (usually >200 ml in adults) or clinical improvement in symptoms
- Airway obstruction is considered reversible when FEV_1 has increased $> 12\%$ after administration of a B_2 agonist
- Failure to demonstrate a change after bronchodilator does not exclude a reversible component of obstruction because airway inflammation may be present and not responsive to B_2 agonist

Role of Spirometry for Monitoring Asthma

- Every patient capable of spirometry should have testing performed at least every 1-2 years
- All MTFs where asthma care is provided should have access to same day spirometry
- Spirometry also indicated in the following situations:
 - After a change in control therapy to document response
 - When symptom history suggests poor control

Monitoring Pulmonary Function

- Monitoring pulmonary function particularly important for patients who are “poor perceivers”
- Spirometry for initial assessment, after treatment initiated, and every 1-2 years
- Spirometry also helpful as check on accuracy of PF meter, assess response to step down in pharmacotherapy, and when PEF unreliable
- For routine monitoring PEF is sufficient in mild and moderate persistent asthma

Peak Flow Monitoring

- Simple, quantitative, reproducible measure of the existence and severity of airflow obstruction
- Tool for ongoing monitoring, not diagnosis
- Use for short-term monitoring, managing exacerbations, and daily long-term monitoring
- Patient's personal best is the reference value

Peak Flow Monitoring

- Patients with moderate to severe persistent asthma need to learn how to monitor their PEF
- PEF monitoring during exacerbations to determine severity and guide treatment in home, clinic and ED
- Long-term daily PEF monitoring is helpful in managing moderate-severe patients to detect early changes in disease status and responses to changes in therapy

“Personal Best” Peak Flow

- Instruction on establishing personal best and using it as basis of action plan
- Personal best estimated over 2-3 weeks, while well, and recorded in early afternoon
- A course of oral corticosteroids may be needed
- Reassessed periodically to account for growth, and disease progression

How to Use a Peak Flow Meter

- Patients 5 yrs and older able to use PF meter
- 5 steps to proper use
 - Move indicator to bottom
 - Standing
 - Deep breath, filling lungs completely
 - Place mouthpiece in mouth, close lips around it, keep tongue out of opening
 - Blow out hard and fast in single breath
- Write down the number, repeat 2 times and record best of 3 blows

Peak Flow Zone System

- Traffic light system, basis of action plan
- **Green Zone** - at least 80% of personal best, good control, no asthma sx's present, take usual meds
- **Yellow Zone** - 50-80 % of personal best, signals caution, take a short-acting B₂ agonist right away and recheck. Asthma may not be under good day-day control
- **Red Zone** - 50 % or less of best, medical alert, short-acting B₂ right away and seek medical advice

How to Monitor Peak Flow

- Establish “personal best” and use as basis of action plan
- Measure first thing in am before medications and late afternoon to assess airflow variability
- When $PEF < 80\% PB$, measure more often
- $PEF < 80\% PB$ indicates need for additional medication
- $PEF < 50\% PB$ indicates severe exacerbation
- Use the same PF meter over time and bring to clinic
- Annually compare PEF readings with